

ATOMIC LAYER-DEPOSITED LaAlO_3 FILMS FOR GATE DIELECTRICS

ABSTRACT

5 A dielectric film containing LaAlO_3 and method of fabricating a dielectric film
contained LaAlO_3 produce a reliable gate dielectric having a thinner equivalent oxide
thickness than attainable using SiO_2 . The LaAlO_3 gate dielectrics formed are
thermodynamically stable such that these gate dielectrics will have minimal reactions
with a silicon substrate or other structures during processing. A LaAlO_3 gate dielectric is
10 formed by atomic layer deposition employing a lanthanum sequence and an aluminum
sequence. A lanthanum sequence uses $\text{La}(\text{thd})_3$ (thd = 2,2,6,6-tetramethyl-3,5-
heptanedione) and ozone. An aluminum sequence uses either trimethylaluminum,
 $\text{Al}(\text{CH}_3)_3$, or DMEAA, an adduct of alane (AlH_3) and dimethylethylamine
[$\text{N}(\text{CH}_3)_2(\text{C}_2\text{H}_5)$], with distilled water vapor.

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